

We CLAIMS:

sub 1
1. A method of accessing values stored in a cache used by a processor of a computer system, comprising the steps of:

loading a plurality of memory blocks from a memory device connected to the processor via a system bus into respective cache lines of the cache;

writing address tags associated with the memory blocks into first and second cache directories of the cache; and

reading a first memory block from the cache using the first cache directory, while reading a second memory block from the cache using the second cache directory.

2. The method of Claim 1 wherein the first and second cache directories are redundant, and said writing step writes a given one of the address tags to a specific line of the first directory and to a specific line of the second directory that corresponds to the specific line of the first directory.

3. The method of Claim 1 wherein the cache has a single cache entry array, and said step of reading the first memory block while reading the second memory block includes the steps of:

constructing a first control signal for the first memory block based on a first location in the first directory of an address tag associated with the first memory block;

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9 applying the first control signal to a first
10 multiplexer having inputs connected to the cache entry
11 array;

12 constructing a second control signal for the second
13 memory block based on a second location in the second
14 directory of an address tag associated with the second
15 memory block; and

16 applying the second control signal to a second
17 multiplexer having inputs connected to the cache entry
18 array.

1 4. The method of Claim 1 wherein the cache has first
2 and second cache entry arrays, and said step reading the
3 first memory block while reading the second memory block
4 includes the steps of:

5 constructing a first control signal for the first
6 memory block based on a first location in the first
7 directory of an address tag associated with the first memory
8 block;

9 applying the first control signal to a first
10 multiplexer having inputs connected to the first cache entry
11 array;

12 constructing a second control signal for the second
13 memory block based on a second location in the second
14 directory of an address tag associated with the second
15 memory block; and

16 applying the second control signal to a second
17 multiplexer having inputs connected to the second cache
18 entry array.

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1 5. The method of Claim 1 wherein the first and second
2 memory blocks are read in a single clock cycle of the
3 processor.

1 6. The method of Claim 2 wherein each of the first and
2 second cache directories have a plurality of congruence
3 classes each having a plurality of lines for storing the
4 address tags, and said step of the processor reading the
5 first memory block while the system bus is reading the
6 second memory block includes the steps of:

7 associating a first requested address with a first
8 congruence class in the first cache directory;

9 comparing each of the address tags stored in the first
10 congruence class with a portion of the first requested
11 address;

12 associating a second requested address with a second
13 congruence class in the second cache directory; and

14 comparing each of the address tags stored in the second
15 congruence class with a portion of the second requested
16 address.

1 7. The method of Claim 3 wherein the first cache
2 directory is connected to a first interconnect on a
3 processor side of the cache, and the second cache directory
4 is connected to a second interconnect on a system bus side
5 of the cache, and said step of reading the first memory
6 block while reading the second memory block further includes
7 the steps of:

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8 presenting the first memory block to the first
9 interconnect by connecting the first interconnect to an
10 output of the first multiplexer; and

11 presenting the second memory block to the second
12 interconnect by connecting the second interconnect to an
13 output of the second multiplexer.

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1 ~~8.~~ The method of Claim 4 wherein the first cache
2 directory is connected to a first interconnect on a
3 processor side of the cache, and the second cache directory
4 is connected to a second interconnect on a system bus side
5 of the cache, and said step of reading the first memory
6 block while reading the second memory block further includes
7 the steps of:

8 presenting the first memory block to the first
9 interconnect by connecting the first interconnect to an
10 output of the first multiplexer; and

11 presenting the second memory block to the second
12 interconnect by connecting the second interconnect to an
13 output of the second multiplexer.

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1 ~~9.~~ The method of Claim ~~6~~ wherein, if an error occurs
2 when examining a particular address tag as part of said step
3 of comparing the address tags stored in the first congruence
4 class, then a redundant address tag is substituted for the
5 particular address tag by examining a line of the second
6 cache directory which corresponds with the line in the first
7 cache directory containing the particular address tag.

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1 10. A computer system comprising:
2 a processor;
3 a memory device;
4 a system bus connected to said memory device;
5 a cache having a plurality of cache lines for storing
6 memory blocks corresponding to addresses of said memory
7 device; and
8 means for simultaneously reading a first memory block
9 from said cache and reading a second memory block from said
10 cache.

1 11. The computer system of Claim 10 wherein said
2 simultaneous reading means includes first and second cache
3 directories.

1 12. The computer system of Claim 10 wherein said
2 simultaneous reading means reads said first memory block and
3 said second memory block in a single clock cycle of said
4 processor.

1 13. The computer system of Claim 11 wherein said first
2 and second cache directories are redundant, and further
3 comprising means for writing an address tag of a memory
4 block which is stored in said cache to a specific line of
5 said first cache directory and to a specific line of said
6 second directory that corresponds to said specific line of
7 said first cache directory.

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14. The computer system of Claim 11 wherein said cache has a single cache entry array, and said simultaneous reading means includes means for:

constructing a first control signal for said first memory block based on a first location in said first directory of an address tag associated with said first memory block;

applying said first control signal to a first multiplexer having inputs connected to said cache entry array;

constructing a second control signal for said second memory block based on a second location in said second directory of an address tag associated with said second memory block; and

applying said second control signal to a second multiplexer having inputs connected to said cache entry array.

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1 15. The computer system of Claim 11 wherein said cache
2 has first and second cache entry arrays, and said
3 simultaneous reading means includes means for:

4 constructing a first control signal for said first
5 memory block based on a first location in said first
6 directory of an address tag associated with said first
7 memory block;

8 applying said first control signal to a first
9 multiplexer having inputs connected to said first cache
10 entry array;

11 constructing a second control signal for said second
12 memory block based on a second location in said second
13 directory of an address tag associated with said second
14 memory block; and

15 applying said second control signal to a second
16 multiplexer having inputs connected to said second cache
17 entry array.

1 16. The computer system of Claim 11 wherein each of
2 said first and second cache directories have a plurality of
3 congruence classes each having a plurality of lines for
4 storing said address tags, and said simultaneous reading
5 means further includes means for:

6 associating a first requested address with a first
7 congruence class in said first cache directory;

8 comparing each of said address tags stored in said
9 first congruence class with a portion of said first
10 requested address;

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11 associating a second requested address with a second
12 congruence class in said second cache directory; and
13 comparing each of said address tags stored in said
14 second congruence class with a portion of said second
15 requested address.

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17. The computer system of Claim 14 further comprising
a first interconnect for communicating with said processor,
and a second interconnect for communicating with said system
bus, and wherein said simultaneous reading means further
includes means for:

presenting said first memory block to said first
interconnect by connecting said first interconnect to an
output of said first multiplexer; and

presenting said second memory block to said second
interconnect by connecting said second interconnect to an
output of said second multiplexer.

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18. The computer system of Claim 15 further comprising
a first interconnect for communicating with said processor,
and a second interconnect for communicating with said system
bus, and wherein said simultaneous reading means further
includes means for:

presenting said first memory block to said first
interconnect by connecting said first interconnect to an
output of said first multiplexer; and

presenting said second memory block to said second
interconnect by connecting said second interconnect to an
output of said second multiplexer.

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19. The computer system of Claim 11 wherein, if an
error occurs when examining a particular address tag as part
of said comparing of said address tags stored in said first
congruence class, then a redundant address tag is
substituted for said particular address tag by examining a
line of said second cache directory which corresponds with a
line in said first cache directory containing said
particular address tag.

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